

## Duke Energy Business Services, LLC

### Smart Grid Deployment

#### Abstract

Duke Energy's (Duke) overall Smart Grid Program began in 2008 and includes the development and implementation of a comprehensive end-to-end solution that transforms its five-state electric system (Indiana, Kentucky, North Carolina, Ohio, and South Carolina) and leads to "beyond the meter" products and services that increase the consumer's role in reducing energy use and carbon emissions. Duke's Smart Grid Deployment project, a part of the Smart Grid Program, includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, Web portals, and direct load control devices to reduce their electricity consumption and peak demand. In December 2008, Duke received a state regulatory order to proceed with this effort in Ohio and continues to work with the other states for similar approval.

#### Smart Grid Features

**Communication infrastructure** includes an open, interoperable two-way network that provides the backbone for AMI and distribution automation systems deployed as part of this project and allows for future integration with distribution automation, substation automation, smart appliances, and home area networks.

**Advanced metering infrastructure** includes 765,961 smart meters. This system provides automated meter reading, enhanced outage notification and response, remote meter connect and disconnect capability and improved detection of theft. More detailed and timely data on peak electricity usage improves load forecasting and capital investment planning.

**Time-based rate programs** include a variety of options implemented in a series of pilot programs. The pilots measure customer load impacts, bill impacts, customer acceptance, and test the capabilities

#### At-A-Glance

Recipient: Duke Energy Business Services, LLC

State: Indiana, Kentucky, North Carolina, Ohio, and South Carolina

NERC Region: ReliabilityFirst Corporation and SERC Reliability Corporation

Total Budget: \$688,480,400

Federal Share: \$200,000,000

Project Type: Integrated and/or Crosscutting Systems

#### Equipment

- 765,961 Smart Meters
- AMI Communication Systems
  - Meter Communications Network
  - Backhaul Communications
- Meter Data Management System
- 100 Home Area Networks
- 100 In-Home Displays
- 100 Direct Load Control Devices for Air-Conditioners and Water Heaters
- Customer Web Portals
- Distribution Automation (DA) Equipment for 1,926 out of 4,741 Circuits
  - DA Communications Network
  - SCADA Communications Network
  - Automated Distribution Circuit Switches
  - Automated Capacitors
  - Circuit Monitors/Indicators

#### Time-Based Rate Programs

- Time-of-Use
- Critical Peak Pricing

#### Key Targeted Benefits

- Reduced Electricity Costs for Customers
- Reduced Meter Reading Costs
- Reduced Operating and Maintenance Costs
- Deferred Investment in Distribution Capacity Expansion
- Improved Electric Service Reliability and Power Quality
- Reduced Costs from Distribution Line Losses and Theft
- Reduced Greenhouse Gas and Criteria Pollutants
- Reduced Truck Fleet Fuel Usage

**Duke Energy Business Services, LLC** (continued)

of the billing software and smart meters. In Ohio, Duke is operating a 1-year pilot that began in June 2010 for time-of-use rates to selected residential customers that have a certified single-phase smart electric meter. Rates are divided into winter and summer months and vary based on the time of day energy is used. The pilot measures customer bill impacts, the customer's experience, the daily/hourly kW and kWh impacts, and leverages enhancements to billing systems capabilities. In addition, Duke is considering a variety of pilot pricing program for the other states including: flat with peak-time rebates, critical peak price, and critical peak price "lite," as well as additional programs as approved by the individual state regulatory commissions.

**Distribution system automation** includes automated switches, capacitors, and reclosers as well as sensors on the distribution system. This distribution system upgrade also includes integrating the supervisory control and data acquisition system (SCADA), geographical interface system, outage management system, and work management system. The integration of these systems provides more efficient system management through a single operator interface and enables the benefits of the distribution automation devices. These devices enable power quality monitoring, voltage regulation, and power flow reconfiguration to limit the spread of power interruptions. This enhanced functionality improves power quality and electric system reliability and lowers operating and maintenance costs.

**Distribution system energy-efficiency improvements** include automated switches and communication for capacitor banks. The automation of the capacitor banks improves power factor and voltage regulation, reducing distribution energy losses while improving service quality for customers. In addition, Duke is supporting plug-in electric vehicles with the distribution system improvements.

**Timeline**

Key Milestones	Target Dates
Distribution automation asset deployment begins	Q1 2009
AMI asset deployment begins	Q3 2009
Distribution automation asset deployment ends	Q1 2013
AMI asset deployment ends	Q1 2013

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